

Wisconsin Household Trash Disposal and Recycling, 1990-2002

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Introduction

This report summarizes data on residential recycling collected each November and December from 1990 through 1995, as well as in 1998 and 2002. During the period from 1990 through 1995 all communities across the State of Wisconsin established comprehensive recycling ordinances and residential recycling programs in accordance with Wisconsin Act 335. The survey data show that household recycling has been both enormously successful and popular with Wisconsin residents. The two ingredients to successful residential recycling have been developing community programs and informing people about how to participate in them. These data show that where communities have built recycling programs and educated people about them, Wisconsin residents recycle.

The intent of Act 335 and of the Wisconsin Department of Natural Resources' (WDNR) efforts has been to divert recyclable materials and various household hazardous wastes from the state's landfills. The implementation of Act 335 created a distinction between the residential (household) portion and the business portion of municipal solid waste. Municipal governments are responsible for arranging residential recycling programs. The WDNR has responsibility for overseeing and supporting these community efforts.

Each year from 1990 through 1995, and again in 1998 and 2002, interviews were conducted with a sample of Wisconsin residents to document the recycling program's progress and to identify any problems. Data for each year were collected by telephone interviews with a simple random sample of 400-500 Wisconsin residents, identified by random-digit dialing (see **Table 1**). Sampling, interviewing, and data entry were performed by the Wisconsin Survey Research Laboratory (1990-1992) and the University of Wisconsin Survey Research Center (1993-2002). In the 2002 portion of this study, 446 people completed interviews; since 1990, a total of 3540 people have taken part in this study. Percentages for each year are generally accurate to plus-or-minus 5%. This report examines trends in residential recycling participation and the main factors affecting the success or failure of residential recycling programs.

Table 1. Survey sample sizes, 1990-1995, 1998, and 2002.

Year	N	Year	N
1990	418	1994	533
1991	414	1995	441
1992	419	1998	417
1993	452	2002	446

Trash Disposal

Most Wisconsin households have curbside trash service, 79% in 2002 (**Table 2**). Since 1990, use of curbside service versus other methods of trash disposal has increased (chi-square=28.19, $p=0.002$) while use of dumpsters has decreased (chi-square=32.30, $p<0.001$). Use of dumpsters has fallen from about 20% of households in the early 1990s to 11% of households in 2002. The proportion of households that take trash directly to the dump has remained relatively unchanged (chi-square=7.73, $p=0.10$) at about 8%. The proportion of households burning trash has only varied slightly, from less than 1% in 1990 to a high of 3% in 1998 and back to less than 1% in 2002 (chi-square=15.09, $p=0.005$).

Table 2. Trash disposal methods, 1990-1995, 1998, and 2002. Percent (%) and total responses (n)*.

	Year (Sample Size)							
	1990 (418)	1991 (414)	1992 (419)	1993 (452)	1994 (533)	1995 (441)	1998 (417)	2002 (446)
Curbside Service	67% ^{a,b} (281)	67% ^{a,b} (276)	70% ^{a,b} (288)	73% ^{b,c,d} (328)	73% ^{a,b,c} (386)	72% ^{a,b} (315)	78% ^{c,d} (322)	79% ^d (350)
Dumpster	19% ^a (81)	21% ^a (85)	21% ^a (90)				11% ^b (46)	11% ^b (51)
Dump or Landfill	11% ^a (45)	10% ^{a,b} (40)	7% ^{a,b} (31)				7% ^b (29)	7% ^b (29)
Burn	<1% ^a (0)	1% ^{a,b,c} (6)	2% ^{b,c} (7)				3% ^c (11)	<1% ^{a,b} (2)
Other	3% (11)	1% (7)	<1% (3)				2% (9)	3% (14)

* Within rows, proportions with the same letter are not significantly different (T-test, $\alpha = 0.05$)

Both municipalities and by private haulers provide curbside trash service. Municipalities serve over twice as many households as private haulers (see **Table 3**). The overall increase in curbside trash service from 1990 to 2002 (see **Table 2**) is due to an increase in the proportion of households with municipal curbside service (chi-square=19.10, $p=0.0007$), while private curbside trash service has continued to serve the same proportion of households (chi-square=6.05, $p=0.20$).

Table 3. Trash service*.

	Year (Sample Size)				
	1990 (418)	1991 (414)	1992 (419)	1998 (417)	2002 (446)
Municipal Curbside Service	44% ^a (183)	50% ^{a,b} (205)	48% ^a (201)	56% ^{b,c} (232)	56% ^c (251)
Private Curbside Service	23% ^a (96)	16% ^b (68)	18% ^{a,b} (77)	19% ^{a,b} (80)	20% ^{a,b} (87)

* Within rows, proportions with the same letter are not significantly different (T-test, alpha = 0.05).

Household experience with private garbage service and volume-based garbage fees is of special interest, because volume-based fees are frequently suggested as an incentive for residents to reduce the amount of trash they produce and to increase the amount they recycle. In 2002, 12% of Wisconsin households paid a hauler directly for private curbside garbage service, with 8% of households paying flat garbage fees and 3% of households paying volume-based garbage fees (see **Table 4**). The proportions paying haulers directly have not changed measurably since 1992 (chi-square=0.04, p=0.98). There appears to have been a slight decrease in the proportion of households paying flat garbage fees since 1992 (chi-square=13.96, p=0.02), but the proportion of households paying volume-based fees appears to have remained unchanged (chi-square=6.04, p=0.3).

Table 4. Trash fees*.

	Year (Sample Size)					
	1992 (419)	1993 (452)	1994 (533)	1995 (441)	1998 (417)	2002 (446)
Pay Hauler Directly	12% ^a (49)				12% ^a (49)	12% ^a (54)
Flat Fee	14% ^a (57)	11% ^{a,b,c} (51)	12% ^{a,b} (63)	13% ^a (56)	8% ^{b,c} (33)	8% ^c (34)
Volume-based Fee	1% ^a (5)	2% ^a (7)	3% ^a (15)	1% ^a (6)	2% ^a (7)	3% ^a (12)

* Within rows, proportions with the same letter are not significantly different (T-test, alpha = 0.05).

In 2002, most Wisconsin households, 56%, feel they are disposing of the same amount of trash as two years ago (see **Table 5**). Only 16% feel they are disposing of more trash, while 28% feel they are disposing of less. Disposing of more or less trash is not related to paying directly for trash service (chi-square=0.60, p=0.74) or to paying volume-based fees (chi-square=4.98, p=0.08).

Table 5. Trash reduction, 2002.

More trash Amount	16% (70)
Same trash Amount	57% (251)
Less trash Amount	28% (122)

Residential Recycling Participation

In 2002, 94% of Wisconsin households were recycling at least some portion of their trash (see **Table 6**). From 1990 through 1998 there were steady increases in the percentage of households that recycled (chi-square=118.09, $p < 0.0001$). From 1990 to 1998, the percentage of households that recycle increased from 83% to 98%. This largely reflected the increase in recycling of the most widely recycled material, aluminum.

Table 6. Household recycling, 1990-1995, 1998, and 2002*.

	Year (Sample Size)							
	1990 (417)	1991 (411)	1992 (417)	1993 (452)	1994 (533)	1995 (441)	1998 (416)	2002 (446)
Household recycling	83% ^a (347)	87% ^b (358)	87% ^{a,b} (361)	92% ^c (414)	94% ^{c,d} (502)	97% ^{d,e} (429)	98% ^e (408)	94% ^{c,d} (421)

* Within rows, proportions with the same letter are not significantly different (T-test, $\alpha = 0.05$).

Among the seven materials for which we have tracked household recycling -- aluminum cans, other metal cans, glass containers, plastic containers, newspapers, cardboard, and other paper -- striking increases were made in some materials from 1990 to 1998. Participation in glass and plastic recycling has doubled; participation in recycling other metal cans has tripled; and cardboard has quadrupled while participation in recycling other paper has increased five-fold (see **Table 7**). Recycling of all materials except cardboard appears to have declined from 1998 to 2002. However, any real decreases have been small, and cannot be reliably measured in a sample of this size.

What these increases in recycling individual materials have meant on the whole is that the average number of materials recycled per household has more than doubled since 1990. In 1990 the average number of materials recycled by Wisconsin households was 2.8. By 1995 there were an average of 5.9 materials recycled per Wisconsin household. Since 1995 there has been no measurable change in the number of materials recycled per Wisconsin household (see **Table 8**).

Table 7. Household recycling, for each material, 1990-1995, 1998, and 2002*.

	Year (Sample Size)							
	1990 (418)	1991 (414)	1992 (419)	1993 (452)	1994 (533)	1995 (441)	1998 (417)	2002 (446)
Aluminum cans	80% ^a (335)	83% ^a (345)	84% ^a (350)	90% ^b (406)	92% ^b (488)	96% ^c (425)	97% ^c (403)	93% ^{b,c} (414)
Other cans	27% ^a (112)	47% ^b (195)	54% ^c (225)	67% ^d (303)	72% ^d (385)	86% ^e (379)	88% ^e (368)	85% ^e (377)
Glass	46% ^a (192)	60% ^b (247)	72% ^c (301)	76% ^c (345)	82% ^d (437)	92% ^e (404)	93% ^e (389)	90% ^e (401)
Plastic	39% ^a (161)	60% ^b (247)	69% ^c (289)	75% ^d (339)	80% ^e (429)	90% ^f (397)	90% ^f (376)	85% ^{e,f} (381)
Newspapers	56% ^a (236)	65% ^b (271)	71% ^c (298)	73% ^{c,d} (332)	77% ^{d,e} (412)	83% ^{e,f} (364)	86% ^f (358)	81% ^{e,f} (362)
Cardboard	19% ^a (80)	34% ^b (140)	40% ^b (166)	46% ^c (209)	56% ^d (301)	73% ^e (323)	76% ^e (315)	79% ^e (350)
Other paper (incl. mixed paper, mail, magazines, catalogs)	15% ^a (61)	23% ^b (94)	33% ^c (137)	38% ^c (171)	48% ^d (254)	73% ^e (323)	83% ^f (346)	80% ^f (359)
Mixed paper, mail						50% ^a (222)	54% ^a (224)	51% ^a (226)
Magazines, catalogs						65% ^a (287)	76% ^b (317)	72% ^b (319)

* Within rows, proportions with the same letter are not significantly different (T-test, alpha=0.05).

Table 8. Household recycling, number of materials, 1990-1995, 1998, and 2002*.

	Year (Sample Size)							
	1990 (418)	1991 (414)	1992 (419)	1993 (452)	1994 (533)	1995 (441)	1998 (417)	2002 (446)
Average number of materials recycled per household*	2.8 ^a	3.7 ^b	4.2 ^c	4.7 ^d	5.1 ^e	5.9 ^f	6.1 ^f	5.9 ^f

* For 1995, 1998, and 2002 all Aother paper≡ is considered one material. Means with the same letter are not significantly different (T-test, alpha = 0.05).

Community Recycling Programs

The largest factor in whether or not a household recycles is the presence or absence of a readily available recycling program. Among households that report being served by a community recycling program, 95% recycle, while among those that do not report being served only 71% recycle (chi-square=329.97, p<0.001).

In 2002, 95% of households reported that community-recycling programs (see **Table 9**) served them. This represents a marked increase over the 61% of households served by community recycling programs in 1990.

This statistic may be compared with reports from community officials, who report that 100% of households are now served. Prior to 1995 this statistic reflected both a lack of community recycling programs in some municipalities, as well as some lack of information about those that existed. Since 1995, the gap between reported community recycling programs and the 100% level reflects solely a lack of information.

Table 9. Community recycling programs, 1990-1995, 1998, and 2002.

	Year (Sample Size)							
	1990 (405)	1991 (401)	1992 (411)	1993 (448)	1994 (529)	1995 (437)	1998 (413)	2002 (440)
Households served by community recycling programs	61% ^a (246)	79% ^b (315)	86% ^c (353)	86% ^c (385)	90% ^c (475)	98% ^d (428)	99% ^d (407)	97% ^d (425)

Many communities have established curbside recycling pickup. A total of 66% of Wisconsin households reported they used curbside recycling in 2002 (see **Table 10**). This was an enormous change from 1990, when the majority of recycling took place in recycling drop-off sites. Part of the increase in curbside recycling has been due to the start of entirely new recycling efforts in some communities, while part is due to a shift from drop-off recycling into curbside programs.

Table 10. Methods of recycling, 1990-1995, 1998, and 2002.

	Year (Sample Size)							
	1990 (418)	1991 (414)	1992 (419)	1993 (452)	1994 (533)	1995 (441)	1998 (417)	2002 (446)
Curbside	15%	28%	42%	42% (192)	56% (298)	61% (269)	67% (280)	66% (294)
Drop-off	64%	56%	43%	40% (180)	29% (153)	25% (109)	18% (75)	18% (79)
Both	4%	2%	1%	8% (38)	8% (44)	10% (44)	11% (47)	9% (42)

Information about Recycling

People tell us that information about their local recycling programs in 2002 is about as good in 2002 as it was in 1992 (see **Table 11**). Public satisfaction with the recycling information they receive was slightly higher in 1994 and 1995, but has since dropped back to previous levels.

Table 11. Satisfaction with local recycling education (on a scale of 1= poor to 4= excellent)*.

	Year					
	1992	1993	1994	1995	1998	2002
Mean rating of local recycling education efforts	2.8 ^a	2.9 ^{a,b}	3.0 ^{b,c}	3.0 ^{b,c}	2.9 ^a	2.8 ^a

* Means with the same letter are not significantly different (T-test, alpha = 0.05).

Nearly half (45%) of households have received information about their local recycling program within the last 6 months (see **Table 12**). But, a third (33%) of households have not received recycling information in more than 1 year.

Table 12. Timeliness of recycling information.

When recycling information was last received	Year
	2002 (431)
Within the last 6 months	45% (194)
Within the last 12 months	22% (94)
More than 12 months ago	33% (143)

Among households with school-age children, many have received recycling information brought home from school. From 1992 to 1998, 60-70% of such households reported that their children brought home recycling information. In 2002, this dropped to only 43% of households with school-age children (see **Table 13**) (chi-square=28.99, $p<0.001$).

Table 13. Recycling information from school children.

	Year (Households with Children)					
	1992 (146)	1993 (157)	1994 (177)	1995 (176)	1998 (135)	2002 (151)
Households with school children bringing home recycling information*	64% (93)	64% (100)	59% (104)	71% (124)	64% (87)	43% (65)

* As a proportion of households with school age children.

Some communities provide information on waste reduction as well as recycling. Only 22% of households reported receiving waste reduction information in 2002, a drop from 31% in 1998 (see Table 14) (chi-square=8.11, $p=0.004$).

Table 14. Waste reduction information

	Year	
	1998 (375)	2002 (393)
Household=s receiving waste reduction information	31% (116)	22% (86)

Apartment & Condominium Recycling

Since 1990 the rental housing sector has closed most of the gap in recycling participation, but still lags behind owner occupied housing (see **Table 15**). This is largely because participation of households in larger apartment and condominium complexes failed to grow much between 1991 and 1994. This difference in participation levels is because rental housing with 4 or less units are generally included in community recycling programs, while rental housing with 5 or more units are treated as a businesses and are therefore ineligible to take part in most community programs. Businesses, while they are also required to recycle, have been slower initiating recycling programs than the residential sector.

Table 15. Housing type and recycling, 1990-1995, 1998, and 2002.

	Year							
	1990 (347)	1991 (358)	1992 (361)	1993 (414)	1994 (502)	1995 (429)	1998 (408)	2002 (421)
owner occupied	87% (266)	91% (278)	89% (267)	93% (294)	97% (352)	99% (311)	>99% (311)	96% (330)
all rental housing	71% (75)	73% (78)	78% (83)	88% (114)	88% (132)	93% (114)	92% (94)	91% (80)
4 or less units	79% (50)	73% (52)	82% (47)	91% (84)	96% (76)	93% (67)	97% (59)	90% (60)
5 or more units	68% (27)	72% (23)	74% (34)	76% (29)	74% (43)	94% (46)	89% (34)	85% (29)

As with recycling and waste reduction information from communities and schools, information provided by landlords to tenants living in buildings with 5 or more apartments may be less likely to be reported in 2002 than in 1998 (see **Table 16**) (chi-square=4.00 p=0.14).

Table 16. Landlord provides recycling information.

	Year		
	1995 (47)	1998 (36)	2002 (32)
Household=s receiving recycling information from a landlord*	72% (34)	78% (28)	56% (18)

* As a proportion of households living in apartment buildings of 5 or more units

Workplace Recycling

In 1990, 71% of the workforce reported that they had recycling in their workplace. By 1995 this proportion had increased to 92%. It has remained relatively constant since then (see table 17). A little more than half the workforce report their workplace provides recycling for customers.

Table 17. Workplace recycling, 1990-1995, 1998, and 2002.

	Year							
	1990 (240)	1991 (243)	1992 (242)	1993 (288)	1994 (339)	1995 (291)	1998 (269)	2002 (280)
Employed, with workplace recycling	71% (171)	73% (178)	79% (191)	84% (241)	83% (282)	92% (267)	89% (239)	90% (252)
Recycling for customers							51% (128)	55% (148)

Public Commitment to Recycling

Public commitment to recycling has risen since 1992. In 1992 56% were strongly committed to recycling. That proportion peaked at 74% strongly committed in 1998. The proportion strongly committed has since fallen to 1994-1995 levels, dropping to 67% strongly committed in 2002. When commitment is measured on a scale of 1 to 4, the same pattern can be seen (see **Table 18**).

Although commitment to recycling has risen and dropped, the public view of the value of their efforts has held more steady. In 1992, 59% felt that their recycling efforts was "definitely worthwhile." By 1998 this proportion had risen to 67%, but in 2002 has dropped to 58%. When value of effort is measured on a scale of 1 to 4, the apparent differences are slight (see **Table 18**).

Table 18. Commitment to recycling (on a scale of 1= not at all committed/worthwhile to 4= strongly committed/very worthwhile)*.

	Year					
	1992	1993	1994	1995	1998	2002
Household commitment to recycling	3.4 ^{a,b}	3.4 ^a	3.5 ^{b,c}	3.6 ^c	3.7 ^d	3.6 ^c
Household finds recycling effort worthwhile	3.5 ^{a,b}	3.4 ^c	3.5 ^{b,c}	3.6 ^{a,b}	3.6 ^a	3.5 ^{b,c}

* Means with the same letter are not significantly different (T-test, alpha = 0.05).

Similarly, public awareness of the recycling law rose during the years that recycling programs were being put in place, but has fallen since 1998 (see **Table 19**). The degree to which the public supports the recycling law follows the same pattern: while the public has predominantly been in favor of the law or strongly in favor of the law, this may be showing early signs of a slight erosion (see **Table 20**).

Table 19. Awareness of recycling law, 1990-1995, 1998, and 2002.

	Year							
	1990 (416)	1991 (413)	1992 (415)	1993 (447)	1994 (521)	1995	1998 (408)	2002 (445)
Household=s aware of recycling law	42% (175)	58% (240)	60% (249)	58% (258)	65% (337)		64% (261)	59% (263)

Table 20. Favor for recycling law, 1990-1995, 1998, and 2002. (1=strongly oppose to 5=strongly favor).

	Year							
	1990	1991	1992	1993	1994	1995	1998	2002
Household=s mean rating of recycling law	4.3 ^{a,b}	4.3 ^{a,c}	4.2 ^{c,d}	4.2 ^d	4.2 ^{c,d}		4.5 ^e	4.4 ^{b,e}

* Means with the same letter are not significantly different (T-test, alpha=0.05).

About 32% of households are recycling more in 2002 than they were two years ago. As the availability of recycling programs grew from 1990-1995, roughly 60-65% of households reported recycling more than in previous years, with most of the remainder recycling about the same as before. Since the program has reached full implementation, a majority now reports that they recycle about the same as in previous years, while most of the rest report increased recycling (see **Table 21**).

Table 21. Household increase/decrease in recycling, 1990-1995, 1998, and 2002.

	Year (Sample Size)							
	1990 (418)	1991 (414)	1992 (419)	1993 (452)	1994 (533)	1995 (441)	1998 (417)	2002 (446)
Recycling more	59% (247)	64% (265)	67% (281)	62% (281)	63% (335)	67% (297)	39% (164)	32% (142)
Recycling the same	21% (88)	19% (77)	29% (121)	30% (135)	32% (169)	29% (127)	57% (237)	58% (257)
Recycling less	2% (10)	4% (15)	2% (10)	6% (27)	5% (25)	3% (14)	3% (13)	9% (42)

Yard Waste

Wisconsin banned the disposal of yard waste in landfills in 1993. Along with other materials banned from landfills, survey respondents were asked how they dispose of their yard wastes -- grass clippings, leaves, and brush. The data show some changes since 1990. Composting and mulching yard waste have remained fairly steady, at about 50% of households that have lawns (see **Table 13**). The proportion of households that leave yard waste on their lawns has risen from a little under 60% prior to the landfill ban, to 73% in 2002. The proportion of households that burn yard waste has also risen since the landfill ban, from less than 10% to 18% in 2002.

Table 22. Yard waste disposal practices, 1990-1995, 1998, and 2002*.

Households with lawns that:	Year							
	1990 (366)	1991 (361)	1992 (362)	1993 (363)	1994 (406)	1995 (350)	1998 (354)	2002 (384)
Compost or mulch	48% ^{a,b} (177)	50% ^{a,b} (181)	54% ^{a,b} (196)	50% ^{a,b} (179)	50% ^{a,b} (203)	55% ^b (191)	44% ^a (155)	53% ^{a,b} (202)
Leave it on lawn	61% ^a (223)	56% ^a (203)	57% ^a (207)				81% ^b (287)	73% ^b (280)
Burn	9% ^{a,b} (34)	7% ^a (25)	8% ^{a,b} (30)	14% ^{b,c} (50)	13% ^{a,b,c} (51)	17% ^c (58)	12% ^{b,c} (44)	18% ^c (68)

* Within rows, proportions with the same letter are not significantly different (Tukey HSD, alpha=0.05)

Household Hazardous Waste

Many households have household hazardous waste or some other difficult to dispose of item: in 2002 72% told us local "Clean Sweep" programs served them. In addition, 79% of households report being served by a motor oil disposal program (see **Table 24**) and 44% report being served by a medical waste disposal program (see **Table 25**).

Table 23. Household hazardous waste disposal*.

	Year	
	1998 (347)	2002 (354)
Households served by AClean Sweep [®] programs	70% ^a (243)	72% ^a (256)

* Proportions with the same letter are not significantly different (T-test, alpha=0.05)

Table 24. Motor oil disposal*.

	Year	
	1998 (342)	2002 (353)
Households served by motor oil programs	81% ^a (277)	79% ^a (280)

* Proportions with the same letter are not significantly different (T-test, alpha=0.05)

Table 25. Medical waste disposal*.

	Year	
	1998 (215)	2002 (215)
Households served by medical waste disposal programs	41% ^a (88)	44% ^a (95)

* Proportions with the same letter are not significantly different (T-test, alpha=0.05)

Summary

Household recycling has greatly increased since 1990 as opportunities for recycling have expanded. Increases in household recycling parallel increases in the numbers of community recycling programs and increases in the more readily available information about recycling. Recycling participation peaked in the late 1990s, sometime between 1995 and 1998. Since then, participation has relaxed somewhat, as apparently information about recycling has become less readily available. The public's commitment to recycling remains enthusiastic, although it too shows signs of slipping as information and participation have decreased.

For additional information on this study, please contact Dr. Ed Nelson, WDNR Bureau of Integrated Science Services (608/266-8910).